

WHAT IS CLAIMED IS:

1. A focusing apparatus comprising:

a distance-measuring device which measures  
distances of a plurality of points in a photographing  
5 field;

a photographing lens;

a driving mechanism which drives the photographing  
lens along an optical axis;

an image pickup device which receives a subject  
10 light flux incident via the photographing lens to  
output a subject image signal; and

a CPU which controls the driving mechanism to  
drive the photographing lens along the optical axis,  
while detecting a contrast of the subject image signal  
15 in a plurality of image pickup areas corresponding to  
the plurality of points and which adjusts a focal  
position of the photographing lens in a position which  
has a highest contrast of the subject image signal in  
an image pickup area corresponding to a point  
20 indicating a shortest distance of an output of the  
distance-measuring device in the plurality of points.

2. The apparatus according to claim 1, wherein  
the distance-measuring device detects a brightness in  
the plurality of points, and

25 the image pickup device sets an integration time  
in the plurality of image pickup areas based on the  
detected brightness.

3. A focusing apparatus comprising:

a distance-measuring device which measures distances of a plurality of points in a photographing field;

5 a photographing lens;

a driving mechanism which drives the photographing lens along an optical axis;

an image pickup device which receives a subject light flux incident via the photographing lens to  
10 output a subject image signal;

an image processing section which processes the subject image signal outputted from the image pickup device; and

a CPU which selects the specific area based on a  
15 part of an output of the distance-measuring device and which operates the driving mechanism to execute a mountain climbing AF operation in accordance with a contrast of the subject image signal in a specific area.

20 4. The apparatus according to claim 3, wherein the CPU selects the specific area based on the output of the distance-measuring device excluding an output indicating a longest distance.

5. A focusing apparatus comprising:

25 an image pickup device including a plurality of image pickup areas;

a focusing lens including an optical path via

which a subject light flux is incident upon the image pickup device;

5 a focusing section which determines a plurality of focusing lens positions from a relation between the position of the focusing lens and a contrast of a subject image signal obtained on the image pickup device via the focusing lens;

10 a distance-measuring section which obtains the position of a subject in a photographing field and a distance to the subject by the subject light flux incident via an optical path different from that of the focusing lens; and

15 a calculation control section which obtains a plurality of combinations of the focusing lens position and the image pickup area for use at the time of the focusing by the position and distance of the subject obtained by the distance-measuring section.

20 6. The apparatus according to claim 5, further comprising: a control section which stops the focusing lens in the plurality of focusing lens positions in accordance with the plurality of combinations and which obtains the contrast of the subject image signal outputted from the image pickup area of the combination corresponding to each focusing lens position and the  
25 contrast of the subject image signal outputted from the image pickup device in all the areas of the image pickup device to determine the position of the focusing

lens.

7. The apparatus according to claim 5, wherein the distance-measuring section includes a divided sensor array, and determines charge accumulation  
5 conditions of the image pickup device at the time of the obtaining of a change in the contrast by the output of the sensor array disposed in the distance-measuring section.

8. A focusing apparatus comprising:  
10 a photographing lens;  
an image pickup section which detects a subject image incident via the photographing lens;  
an optical system which is different from the photographing lens;  
15 a distance-measuring section which uses the optical system different from the photographing lens to measure a subject distance of a plurality of points in a photographing field; and  
a determining section which focuses the  
20 photographing lens on a plurality of focal positions corresponding to a plurality of distance measurement results of the distance-measuring section and which determines an area to execute a mountain climbing AF based on contrasts obtained at the plurality of focal  
25 positions and the distance measurement results.

9. A camera including a focusing apparatus, comprising:

an irradiation device which selectively switches irradiation and non-irradiation of a subject with an auxiliary light for distance measurement;

a photographing lens;

5 a driving circuit which drives the photographing lens along an optical axis direction;

an image pickup device which receives a light flux incident from the subject via the photographing lens to output a subject image signal;

10 an image processing circuit which processes the subject image signal outputted from the image pickup device;

a distance-measuring device which includes a pair of optical systems and a pair of sensors for distance measurement to detect a plurality of subject images incident via the pair of optical systems and which outputs information associated with a subject distance based on the plurality of subject images detected by the sensors for distance measurement and which detects the plurality of subject images in a case where the subject has a low brightness; and

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a CPU which selectively executes a first auto-focus operation of detecting a contrast state based on the subject image signal processed by the image processing circuit to adjust a focus of the photographing lens, a second auto-focus operation of performing a distance-measuring operation by the

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distance-measuring device in a non-irradiation state of the auxiliary light for distance measurement to adjust the focus of the photographing lens in accordance with a result of the distance-measuring operation, and a  
5 third auto-focus operation of performing the distance-measuring operation by the distance-measuring device in an irradiation state of the auxiliary light for distance measurement to adjust the focus of the photographing lens in accordance with the result of the  
10 distance-measuring operation.

10. The camera according to claim 9, wherein the CPU judges whether or not the subject indicates the low brightness and executes any of the first, second, and third auto-focus operations in accordance with the  
15 result of the judgment.

11. The camera according to claim 10, wherein the CPU executes the second auto-focus operation and judges that the subject indicates the low brightness, when the output of the sensors for distance measurement indicate  
20 a level not more than a predetermined level as a result of the second auto-focus operation.

12. The camera according to claim 11, wherein the CPU executes the third auto-focus operation, when the subject is judged to indicate the low brightness.

25 13. The camera according to claim 9, wherein the CPU executes the second auto-focus operation, and executes the first auto-focus operation, when the

subject is judged to exist in a distance shorter than a predetermined distance.

14. A camera including a focusing apparatus, comprising:

- 5           a photographing lens;
- a first auto-focus section which adjusts a focus of the photographing lens based on a contrast of a subject image obtained via the photographing lens;
- a pair of optical systems which are different from  
10       the photographing lens;
- a second auto-focus section which adjusts the focus of the photographing lens based on a pair of subject images obtained via the pair of optical systems;
- 15       a flash light irradiating section which irradiates a subject with a flash light;
- a judging section which judges whether or not an auto-focus operation by the first auto-focus section is appropriate; and
- 20       a control section which operates the first auto-focus section, when the judging section judges that the auto-focus operation by the first auto-focus section is appropriate and which operates both the second auto-focus section and the flash light  
25       irradiating section, when the judging section judges that the auto-focus operation by the first auto-focus section is inappropriate.

15. A camera including a focusing apparatus,  
comprising:

a photographing lens;

an image pickup device which acquires an image  
5 signal of a subject in a photographing field via the  
photographing lens at the time of photographing;

an optical system which is different from the  
photographing lens;

a distance-measuring section which uses the  
10 optical system different from the photographing lens to  
acquire a plurality of image signals and which obtains  
a distance of a main subject based on the acquired  
plurality of image signals prior to the photographing;

a projecting section which emits a light to the  
15 main subject in a case where the plurality of image  
signals acquired by the distance-measuring section are  
inappropriate for an operation of obtaining the main  
subject distance by the distance-measuring section; and

a control section which controls a focus of the  
20 photographing lens in accordance with the distance of  
the main subject obtained by the distance-measuring  
section with the emission of the projecting section and  
which determines whether or not to continuously control  
the focus by a contrast change of the image signal  
25 outputted from the image pickup device with a focal  
position movement of the photographing lens.

16. A camera including a focusing apparatus,



comprising:

a photographing lens;

an image pickup device which acquires a subject image signal via the photographing lens;

5 a first focusing control section which detects a contrast of the subject image signal acquired by the image pickup device to control the focusing of the photographing lens based on the detected contrast;

10 a projecting section which projects a light to a subject;

an optical system for distance measurement which acquires a plurality of subject image signals different from the subject image signal acquired by the image pickup device during the projection by the projecting section;

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a distance-measuring section which obtains a subject distance based on the plurality of subject image signals acquired via the optical system for distance measurement;

20 a second focusing control section which controls the focusing of the photographing lens based on the subject distance obtained in the distance-measuring section; and

a determining section which determines whether to control the focusing by the first focusing control section or the second focusing control section in accordance with the subject distance obtained by

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the distance-measuring section.

17. The camera according to claim 16, wherein the projecting section is a flash light irradiating section which irradiates the subject with a flash light.

5        18. The control according to claim 16, wherein the distance-measuring section acquires a pair of subject image signals via the optical system for distance measurement and obtains the subject distance from a phase difference between the pair of subject image  
10        signals.

19. The camera according to claim 16, wherein the distance-measuring section includes a detecting section which detects a contrast of the pair of subject image signals acquired via the optical system for distance  
15        measurement, and

the determining section repeats the projection by the projecting section while controlling the focusing by the first focusing control section, when the subject distance obtained by the distance-measuring section is  
20        shorter than a predetermined value and when the contrast obtained by the detecting section is larger than the predetermined value.

20. The camera according to claim 16, wherein the distance-measuring section includes a detecting section which detects a contrast of the pair of subject image  
25        signals acquired via the optical system for distance measurement,

the camera including the focusing apparatus  
further comprising: a third focusing control section  
which controls the focusing of the photographing lens  
based on an amount of a reflected light of the light  
5 projected onto the subject by the projecting section,  
when the contrast detected by the detecting section is  
smaller than a predetermined value.

21. A camera including a focusing apparatus,  
comprising:

10 a photographing lens;

an image pickup device which acquires a subject  
image signal via the photographing lens;

a first auto-focus section which performs focusing  
of the photographing lens based on a contrast of the  
15 subject image signal acquired by the image pickup  
device;

a pair of optical systems which are different from  
the photographing lens;

a distance-measuring device which uses a pair of  
20 subject image signals acquired via the pair of optical  
systems to perform distance measurement;

a second auto-focus section which performs the  
focusing of the photographing lens in accordance with a  
distance measurement result of the distance-measuring  
25 device;

a flash light irradiating section which irradiates  
a subject with a flash light;

a judging section which judges whether or not the pair of subject image signals obtained via the pair of optical systems or the subject image signal acquired by the image pickup device is appropriate for a distance-measuring operation of the distance-measuring device;  
5 and

a control section which irradiates the subject with the flash light in accordance with a judgment result of the judging section by the flash light  
10 irradiating section and which performs the focusing of the photographing lens preferentially by the second auto-focus section.

22. A camera including a focusing apparatus, comprising:

15 a flash section which irradiates a subject with an auxiliary light;

a photographing lens;

a contrast type focusing section which acquires a subject image signal at the time of displacement of the photographing lens by a micro amount via the  
20 photographing lens and which determines a focusing position in accordance with a contrast change of the acquired subject image signal to control the focusing of the photographing lens;

25 an optical system which is different from the photographing lens;

a distance-measuring section which acquires

a plurality of subject image signals via the optical system different from the photographing lens to measure a distance of the subject based on the acquired plurality of subject image signals; and

5           a control section which determines whether to continue focusing control by the contrast type focusing section or to change to the focusing control to determine the focusing position based on the distance measured by the distance-measuring section, based on  
10           the plurality of subject image signals acquired by the distance-measuring section when the subject is irradiated with the auxiliary light by the flash section.

23. The camera according to claim 22, wherein the  
15           control section controls the irradiation of the subject with the auxiliary light by the flash section and controls the focusing by the contrast type focusing section, when the distance of the subject measured by the distance-measuring section is shorter than  
20           a predetermined value at the time of the irradiation with the auxiliary light by the flash section, and the contrast of the plurality of subject image signals acquired by the distance-measuring section is larger than a predetermined value.

25           24. A camera including a focusing apparatus, comprising:

          a photographing lens;

a driving mechanism which drives the photographing lens along an optical axis direction;

an image pickup device which receives a subject light flux incident via the photographing lens to  
5 output the subject image signal;

an image processing circuit which processes the subject image signal outputted from the image pickup device;

a distance-measuring device which includes a pair  
10 of optical systems and a pair of sensors for distance measurement to detect a pair of subject images incident via the pair of optical systems and which outputs information associated with a subject distance based on the subject images detected by the sensors for distance  
15 measurement; and

a CPU which detects the subject image signal processed by the image processing circuit or a brightness distribution of the pair of subject images detected by the sensors for distance measurement to  
20 select either one of the first and second auto-focus operations based on the detection result and which selectively executes a first auto-focus operation of detecting a contrast based on the subject image signal processed by the image processing circuit to adjust a  
25 focus of the photographing lens, and a second auto-focus operation of performing a distance-measuring operation by the distance-measuring device to adjust

the focus of the photographing lens in accordance with a result of the distance-measuring operation.

25. A camera including a focusing apparatus, comprising:

5           a photographing lens including a diaphragm mechanism;

          an image pickup section which includes an image pickup device to photograph a subject image incident via the photographing lens to obtain a subject image  
10          signal;

          a setting section which sets conditions of an image pickup operation by the image pickup section;

          a first auto-focus section which focuses the photographing lens from a contrast of the subject image  
15          signal obtained by the image pickup section;

          a pair of optical systems for distance measurement which are different from the photographing lens;

          a distance-measuring section which includes a pair of sensors for distance measurement to acquire a pair  
20          of subject image signals via the pair of optical systems for distance measurement and which performs a distance-measuring operation to calculate a subject distance from the pair of subject image signals;

          a second auto-focus section which focuses the photographing lens based on the distance measurement  
25          result of the distance-measuring section;

          a selecting section which detects the subject

image signal obtained by the image pickup device or a brightness distribution of the pair of subject image signals obtained by the sensors for distance measurement to select either one of the first and  
5 second auto-focus sections in accordance with a ratio of a low-brightness portion in the detected brightness distribution; and

a change section which changes the conditions of the distance-measuring operation set by the setting  
10 section, when the selecting section selects the second auto-focus section.

26. The camera according to claim 25, wherein the conditions of the image pickup operation set by the setting section include at least aperture value  
15 information of the diaphragm mechanism, shutter speed information of a shutter to expose an image pickup plane of the image pickup device, and sensitivity information of the image pickup device.

27. The camera according to claim 26, wherein the  
20 change section changes the aperture value information and the sensitivity information set by the setting section.

28. The camera according to claim 27, wherein the  
25 change section the aperture value information so as to narrow down the diaphragm mechanism by a value larger than that in the aperture value information set by the setting section and changes the sensitivity of the



image pickup device so as to raise the sensitivity of the image pickup device.

29. A camera including a focusing apparatus, comprising:

5           a photographing lens;

          a first auto-focus section which includes an image pickup device to obtain a contrast of a subject image signal obtained via the photographing lens and which adjusts a focus of the photographing lens based on the contrast of the subject image signal obtained by the image pickup device;

          a pair of optical systems which are different from the photographing lens;

          a second auto-focus section which includes a distance-measuring device to perform a distance-measuring operation based on a pair of subject image signals obtained via the pair of optical systems and which adjusts the focus of the photographing lens in accordance with the output of the distance-measuring device;

          a detecting section which detects the subject image signal obtained by the image pickup device or a brightness distribution of the pair of subject image signals obtained by the distance-measuring device; and

25           a change section which selects the second auto-focus section in accordance with a ratio of a low-brightness portion of a brightness distribution

detected by the detecting section and which changes an aperture value of the diaphragm mechanism in the photographing lens and a sensitivity of the image pickup device.

5           30. A camera including a focusing apparatus, comprising:

          a photographing lens;

          an optical system which is different from the photographing lens;

10           a distance-measuring section which acquires a plurality of subject image signals via the optical system different from the photographing lens prior to a photographing operation to obtain a distance of a main subject based on the acquired plurality of subject  
15 image signals; and

          a judging section to judge a scene in which sensitized photographing is possible by a brightness change in the plurality of subject image signals acquired by the distance-measuring section, the judging  
20 section controlling focusing of the photographing lens in accordance with the distance of the main subject obtained by the distance-measuring section and changing a diaphragm of the photographing lens and a sensitization sensitivity at the time of the  
25 photographing, when judging the scene in which the sensitized photographing is possible.

          31. A camera including a focusing apparatus,

comprising:

a photographing lens including a zoom optical system;

5 an image pickup section which photographs a subject via the zoom optical system to obtain a subject image signal;

an optical system which is different from the photographing lens;

10 a distance-measuring section which acquires a plurality of subject image signals via the optical system different from the photographing lens to measure a subject distance based on the acquired plurality of subject image signals;

15 a first focusing control section which determines a focusing position of the photographing lens based on an output of the distance-measuring section;

20 a second focusing control section which determines the focusing position of the photographing lens based on a contrast change of the subject image signal acquired by the image pickup section, when the photographing lens is slightly driven;

a zoom position detecting section which detects the position of the zoom optical system; and

25 a selecting section which selects either one of the first and second focusing control sections in accordance with the position of the zoom optical system detected by the zoom position detecting section and

a brightness change of the subject image signal acquired by the image pickup section.

5        32. The camera according to claim 31, wherein the selecting section selects the first focusing control section, when the position of the zoom optical system detected by the zoom position detecting section is on the side of a wide angle and a brightness change of the subject image signal acquired by the image pickup section is small.